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ENVIRONMENT

Mr. Roger Papler
Engineering Geologist
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject:
Work Plan Addendum for Vapor Intrusion Evaluation of Fourteen Properties in the Off-Property Study Area, Former Teledyne/Spectra-Physics Sites, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, California

Date:
December 19, 2013

Contact:
Erica Kalve, P.G.

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Erica.Kalve@ARCADIS-US.com

Our ref:
EM001727.0070

Dear Mr. Papler:

This letter serves as a Work Plan Addendum to the September 24, 2010 "Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road for the former Teledyne Semiconductor and former Spectra-Physics Lasers Sites" ("2010 Work Plan"). The sites are located respectively at 1250 West Middlefield Road and 1300 Terra Bella Avenue, Mountain View, California ("the Study Area"; Figure 1). ARCADIS U.S., Inc. (ARCADIS) prepared the 2010 Work Plan and this Work Plan Addendum on behalf of TDY Industries, LLC, for the former Teledyne Semiconductor Site and Thermo Fisher Scientific, Inc., for the former Spectra-Physics Laser Site. TDY Industries, LLC and Thermo Fisher Scientific, Inc., are collectively referred to as "the Companies". The scope of work contained in this Work Plan Addendum only applies to 14 of the 15 North Bayshore Commercial Buildings as outlined in Figure 2.

This Work Plan Addendum was prepared in accordance with various communications with representatives of the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) and the United States Environmental Protection Agency (USEPA) regarding additional sampling to evaluate potential vapor intrusion in buildings with the heating, ventilation, and air conditioning (HVAC) systems turned off. Those communications included (1) discussions during the May 15, 2013 meeting between representatives of the RWQCB, the USEPA, the Companies, and ARCADIS; (2) the April 30, 2013 RWQCB letter, titled Requirement for Workplan Addendum for Vapor Intrusion Evaluation for the "Former Teledyne Property at the Former Teledyne/Spectra-Physics Site, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, Santa Clara County"; (3) the June 21, 2013 Work Plan Addendum; (4) the RWQCB July 2, 2013 comments to the June 21, 2013 Work Plan Addendum; (5) the July 25, 2013 meeting between representatives of the

RWQCB, the USEPA, the Companies, and ARCADIS; (6) revised comments to the June 21, 2013 Work Plan Addendum received on July 30, 2013, and (7) the USEPA letter dated December 5, 2013 entitled "USEPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites" ("USEPA Region 9 Guidelines"; USEPA, 2013b).

Sampling indoor air concentrations with the HVAC system off can be a diagnostic tool to evaluate if soil gases are capable of entering the building under worst case conditions. However, such results are not representative of actual exposure conditions.

**Updated Roles and Responsibilities**

The 2010 Work Plan outlined the project team's roles and responsibilities, including RWQCB and USEPA Region 9 Superfund Division oversight. Only one change has been made to the project team since submittal of the 2010 Work Plan: Ms. Melanie Morash now serves as the USEPA project manager and Technical Lead for implementation of the work detailed in the 2010 Work Plan and this Work Plan Addendum.

**Data Evaluation and Reporting Updates**

Field analytical methods, sample documentation, quality assurance, and data evaluation and reporting methods will be conducted as described in the 2010 Work Plan with incorporation of the following revisions (ARCADIS, 2010). Sample results for HVAC on and HVAC off will be assessed using a tiered approach, as defined below:

- Tier 1: Indoor air sample results will be compared to outdoor air concentrations to evaluate whether indoor air quality may be affected by sources unassociated with vapor intrusion.

- Tier 2: Indoor air sample results will be compared to long-term screening criteria and site-specific exposure scenarios (regional screening levels [RSLs]; USEPA, 2013a).

- Tier 3: Indoor air sample results will be compared to short-term screening criteria (Agency for Toxic Substances and Disease Registry [ATSDR] Minimal Risk Levels [MRLs] and USEPA Region 9 Guidelines; [ATSDR, 2013; USEPA, 2013b]). If indoor air concentrations exceed short-term

screening levels, immediate interim action may be implemented as appropriate and feasible, including changing the building's HVAC system operation (i.e., to run continuously or at new operating standards) as an interim response action until a permanent path forward is determined. This action should be implemented within 72 hours of receiving the results.

The tiered screening level assessment for samples collected with the HVAC system turned off will not provide a direct indication of exposure, but will be used to indicate the potential for vapor intrusion to occur. Throughout the duration of the study, changes in screening levels will be evaluated and incorporated, as appropriate.

**Sampling and Mitigation Plan Updates**

ARCADIS has completed sampling in accordance with the 2010 Work Plan at 10 of the 14 commercial buildings detailed in this Work Plan Addendum. These prior sampling events were conducted during normal operating hours with the HVAC systems operational (ARCADIS, 2013). ARCADIS is continuing work to obtain access to the remaining buildings and additional sampling in buildings with the HVAC system operational is likely. Additionally, some commercial buildings have been renovated since the first sampling event and, if warranted, those buildings will need to be reassessed and sampled with the HVAC system operational.

In consideration of the potential scenarios that may occur for HVAC on and HVAC off sample results obtained during future indoor air sample events, the following additional sampling and mitigation plans were developed:

- An indoor air sampling plan was developed for buildings that have not been sampled with the HVAC system turned on and for buildings that were previously sampled but were recently remodeled (starting on Figure 3A).

- An indoor air sampling and mitigation plan was developed for buildings with indoor air concentrations in exceedance of Tier 2 screening criteria with the HVAC system operational (Figure 3B).

- An indoor air sampling and mitigation plan was developed for buildings that were not remodeled (or were remodeled but then re-sampled) in which indoor air concentrations were less than screening criteria with HVAC system operational (Figure 3C).

Each revised sample plan is described in detail below.

*Indoor Air Sampling Plan for Buildings that Have Not Been Sampled with HVAC System Turned On and Previously Sampled Buildings that Have Been Remodeled*

Buildings not previously sampled and buildings previously sampled that have been remodeled will be handled as described commencing on Figure 3A. After completion of the corresponding access agreement, ARCADIS will conduct the building survey and walk through with HVAC maintenance staff and USEPA representatives, identifying discrete ventilation zones, unique building features, and pathway and breathing zone sample locations. Some significant volatile organic compound (VOC) effects on indoor air quality may come from the use of consumer products, building materials, and personal activities. If identified, indoor sources of VOCs will be removed from the building, if feasible. The building will then be sampled during normal business hours under normal HVAC operating conditions in accordance with the 2010 Work Plan (ARCADIS, 2010).

Response actions will be determined based on the following screening level evaluation results:

- If indoor air concentrations measured under normal HVAC operating conditions are greater than long-term screening levels (Tier 2), the building will be handled as described in Figure 3B. This process is described in more detail below in the subsection titled *"Indoor Air Sampling and Mitigation Plan in Buildings with Indoor Air Concentrations in Exceedance of Screening Criteria with HVAC Operational"*

- If indoor air concentrations measured under normal HVAC operating conditions are less than long-term screening levels (Tier 2), the building will be handled as described in Figure 3C. This process is described in more detail below in the subsection titled "*Indoor Air Sampling and Mitigation Plan in Buildings with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational"*

*Indoor Air Sampling and Mitigation Plan in Buildings with Indoor Air Concentrations Greater than Screening Criteria with HVAC Operational*

Response actions in buildings with indoor air concentrations with HVAC system operational exceeding long-term screening levels (Tier 2) will be determined based on the following screening level evaluation results (as shown in Figure 3B):

- If indoor air concentrations measured under normal HVAC operating conditions are greater than long-term criteria (Tier 2) but less than short-term criteria (Tier 3), the building will be further evaluated to determine if potential exposure scenarios assumed during development of the screening criteria are present (USEPA, 2013a). ARCADIS will then work with the Companies, RWQCB, and USEPA to evaluate whether mitigation is recommended (Attachment A). If mitigation is not recommended, the building will be sampled with the HVAC system off as described in Figure 3C and discussed below in the Section titled *"Indoor Air Sampling and Mitigation Plan in Buildings with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational"*

- If indoor air concentrations measured under normal HVAC operating conditions are greater than short term screening levels (Tier 3), immediate interim action may be implemented as appropriate and feasible, including optimizing the building's HVAC system as an interim response action pending further building evaluation. Optimization of the HVAC system would typically focus on providing effective and appropriate air exchange in all occupied spaces and avoiding excessive depressurization of spaces on the ground floor. This action should be implemented within 72 hours of receiving the results.
  - Following implementation of the interim response action, an additional round of indoor air sampling will be conducted to assess the effectiveness of the interim response action.
  - The building will then be further evaluated to assess potential secondary sources contributing to indoor air concentrations, and pathway identification and mitigation, as warranted (Attachment A).

Following building evaluation and mitigation, as warranted, a confirmation sampling event will be conducted with the HVAC system off at the initial breathing zone and pathway sample locations. If feasible, the HVAC system will be turned off at least 36 hours prior to conducting the sampling event to provide representative HVAC off data, and will remain off for the duration of the sampling event. Adequate notice will

be provided to building management and potential occupants about the testing and schedule for when the ventilation system will be shut off. Sample duration may be 8 hours, 10 hours, 12 hours, or 24 hours, depending on the HVAC on sample duration. Samples will be collected in accordance with the Quality Assurance Project Plan (QAPP) described in the 2010 Work Plan (ARCADIS, 2010).

Results of the confirmation sampling event will be evaluated using the tiered approach and additional response actions are as follows:

- If indoor air concentrations sampled during the post-mitigation confirmation sampling event are less than Tier 2 criteria, no further sampling or mitigation will be necessary.

- If indoor air concentrations measured during the post-mitigation confirmation sampling event are greater than Tier 2 criteria, indicating HVAC system operation (and optimization, as warranted) is necessary to provide an adequate reduction in indoor air concentrations, the HVAC system will be turned on and set to run at new operating standards.

Previous indoor air results in this subset of buildings indicate concentrations were greater than Tier 2 screening criteria with the HVAC system on, therefore, in the case where mitigation activities were ineffective at reducing indoor air concentrations with the HVAC system off, an additional round of confirmation sampling with the HVAC system operating at new standards will be necessary to confirm effectiveness of HVAC operation at reducing indoor air concentrations.

If the confirmation sampling event indicates HVAC operation is effective at reducing indoor air concentrations below Tier 2 screening criteria, ARCADIS will work with the Companies, property owners/tenants, USEPA, and RWQCB to establish a periodic HVAC system and/or indoor air monitoring and verification procedure. If the confirmation sampling event indicates indoor air concentrations remain above Tier 2 screening criteria with the HVAC system operating at new standards, ARCADIS will work with the Companies, property owners/tenants, USEPA, and RWQCB to evaluate alternative mitigation measures.

*Indoor Air Sampling and Mitigation Plan in Buildings with Indoor Air Concentrations Less than Screening Criteria with HVAC Operational*

Buildings previously sampled with indoor air concentrations less than screening criteria with the HVAC system operational will be handled as described in Figure 3C.

If indoor air concentrations are less than long-term screening criteria under normal HVAC operating conditions (or exposure scenarios are not present) in buildings previously sampled that have since been remodeled and re-sampled, these buildings will also be handled as described in Figure 3C. Buildings falling under this category will be sampled with the HVAC system turned off and indoor air concentrations will be evaluated against tiered criteria as previously described. Response actions will be determined based on the following screening level evaluation results:

- If indoor air concentrations with the HVAC system off do not exceed Tier 1 or Tier 2 criteria, no further action will be necessary.

- If indoor air concentrations with the HVAC system off exceed Tier 2 criteria but are less than Tier 3 criteria, the building will be further evaluated to determine if potential exposure scenarios assumed during development of the screening criteria are present (USEPA, 2013a). ARCADIS will then work with the Companies, RWQCB, and USEPA to evaluate whether mitigation is recommended (Attachment A). If mitigation is not recommended, no further action will be necessary.

- As described previously, if indoor air concentrations with the HVAC system off exceed Tier 3 criteria, the HVAC system should be set to run continuously within 72 hours as an interim response action. The building will be further evaluated to confirm the results and assess exposure scenarios, potential secondary sources contributing to indoor air concentrations, and pathway identification and mitigation, as warranted. This process is described in more detail in Attachment A.

Following building evaluation and mitigation, as warranted, a confirmation sampling event will be conducted with the HVAC system off at the initial breathing zone and pathway sample locations in accordance with the QAPP and the sampling plans described previously in this Work Plan Addendum. Results of the confirmation sampling event will be evaluated using the tiered approach and additional response actions are as follows:

- If indoor air concentrations sampled during the post-mitigation confirmation sampling event are less than Tier 2 criteria, no further sampling or mitigation will be necessary.

- If indoor air concentrations measured during the post-mitigation confirmation sampling event are greater than Tier 2 criteria, indicating HVAC system

operation is necessary to provide an adequate reduction in indoor air concentrations, the HVAC system will be turned on and set to run at controlled operating conditions.

Previous indoor air results in this subset of buildings indicate concentrations are less than screening criteria with the HVAC system on under normal operating standards; therefore immediate sampling will not be necessary to confirm effectiveness of HVAC operation at reducing indoor air concentrations. ARCADIS will work with the Companies, property owners/tenants, USEPA, and RWQCB to establish a periodic HVAC system and/or indoor air monitoring and verification procedure.

Sincerely,

ARCADIS U.S., Inc.

Erica Kalve, P.G.
Senior Geologist

Leigh Neary
Environmental Engineer

Attachments:

| | |
|---|---|
| Figure 1 | Site Vicinity Map and Property Locations |
| Figure 2 | Site Map Showing Commercial Buildings included in Work Plan Addendum |
| Figure 3A | Decision Flow Chart – Buildings that Have Not Been Sampled with HVAC On or Have Been Remodeled |
| Figure 3B | Decision Flow Chart – Buildings that Have Been Sampled with HVAC On and Exceeded Tier 2 Criteria |
| Figure 3C | Decision Flow Chart – Buildings with Indoor Air Concentrations less than Screening Criteria with HVAC On (Remodeled or Remodeled and Re-sampled) |
| Attachment A | Secondary Source Identification and Mitigation |

References:

ARCADIS, 2010. Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road, Teledyne Semiconductor and Spectra-Physics Laser, Inc., Sites, Mountain View, CA. September 24.

ARCADIS, 2013. Revised Focused Feasibility Study. Former Spectra-Physics Lasers, Inc. and Former Teledyne Semiconductor Facilities, Mountain View, California. April 4

ATSDR, 2013. Minimum Risk Levels List. Available at: http://www.atsdr.cdc.gov/mrls/mrllist.asp. Revised July 2013.

USEPA, 2013a. Regional Screening Levels for Chemical Contaminants. Available at: http://www.epa.gov/region9/superfund/prg/. Revised November 2013.

USEPA, 2013b. EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites. December 5.

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Mr. Jim Diel, Union Pacific Railroad

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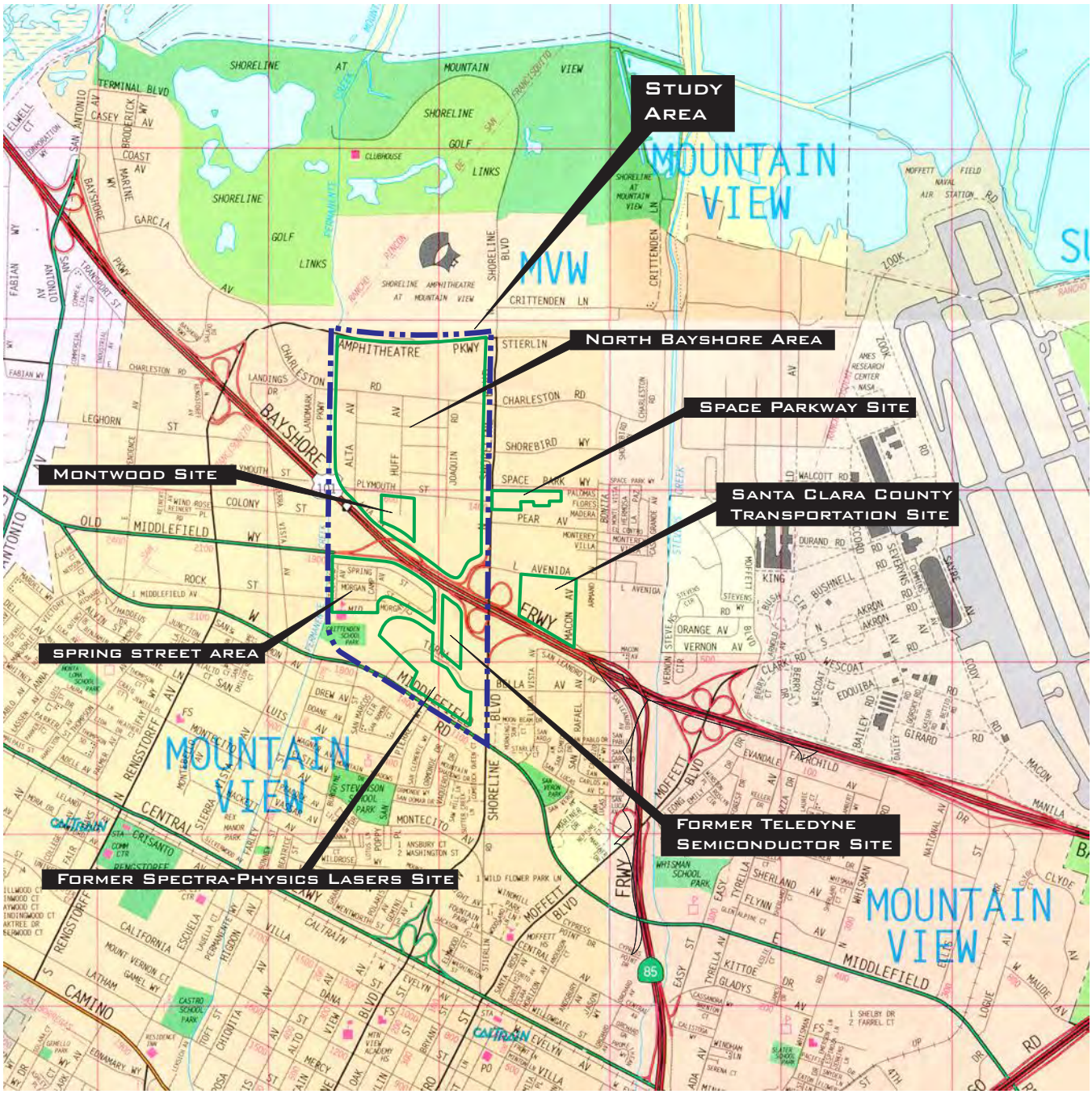
**Figures**




0 1/2 MILE

GRAPHIC SCALE

SOURCE: THOMAS BROS GUIDE

FORMER SPECTRA-PHYSICS AND
FORMER TELEDYNE SEMICONDUCTOR FACILITIES

# SITE VICINITY MAP AND PROPERTY LOCATIONS

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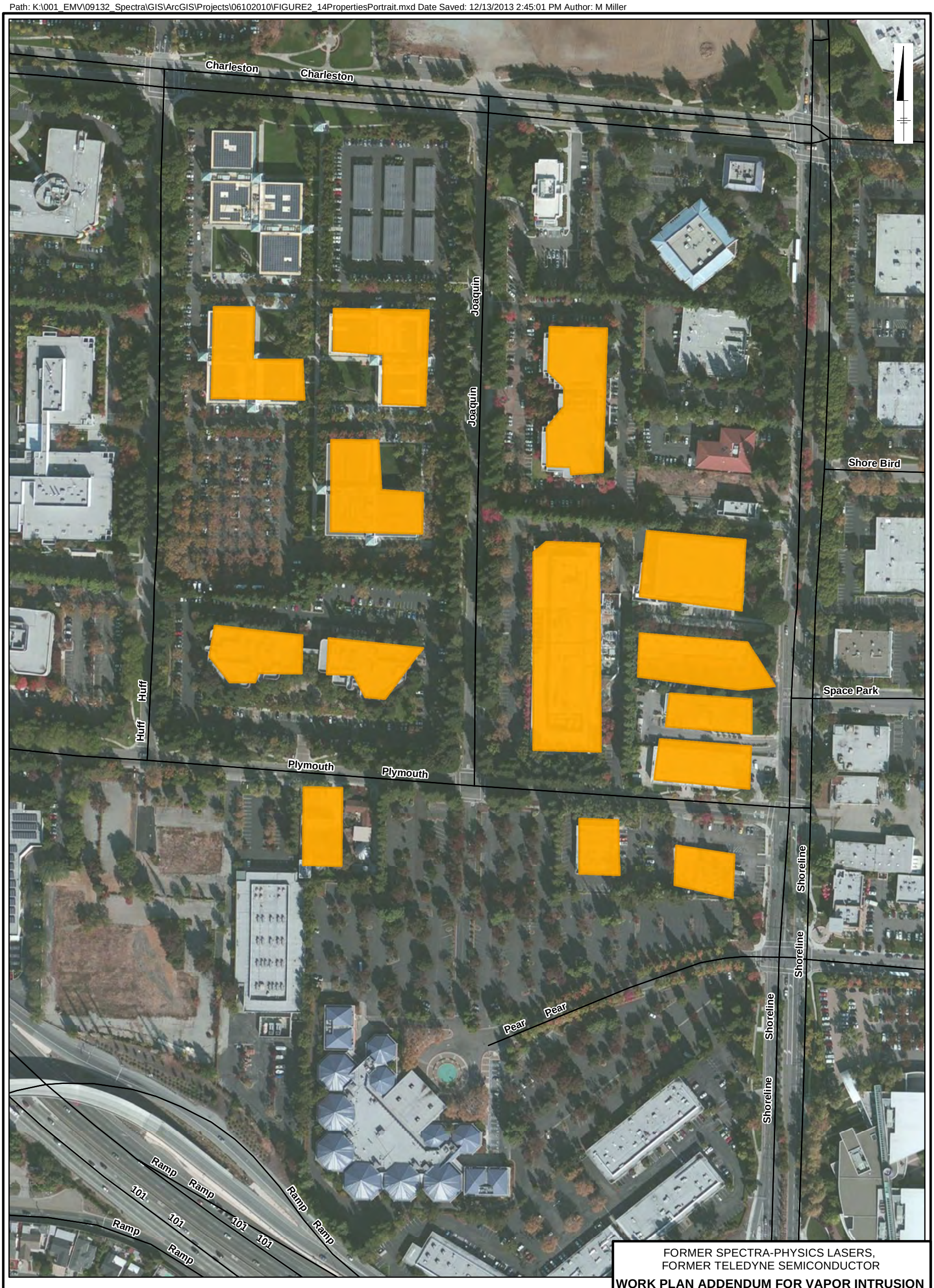
FIGURE
1

G:\ENVCAD\Emeryville\ACT\EM001727\EM001727 SV01ver2.cdr

Path: K:\001_EMV\09132_Spectra\GIS\ArcGIS\Projects\06102010\FIGURE2_14PropertiesPortrait.mxd Date Saved: 12/13/2013 2:45:01 PM Author: M Miller




**Legend**

COMMERCIAL BUILDING INCLUDED IN STUDY AREA

N

0 200 400

SCALE IN FEET

FORMER SPECTRA-PHYSICS LASERS,
FORMER TELEDYNE SEMICONDUCTOR

**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF FOURTEEN PROPERTIES IN THE OFF-PROPERTY STUDY AREA**

# SITE MAP SHOWING COMMERCIAL BUILDINGS INCLUDED IN WORK PLAN ADDENDUM

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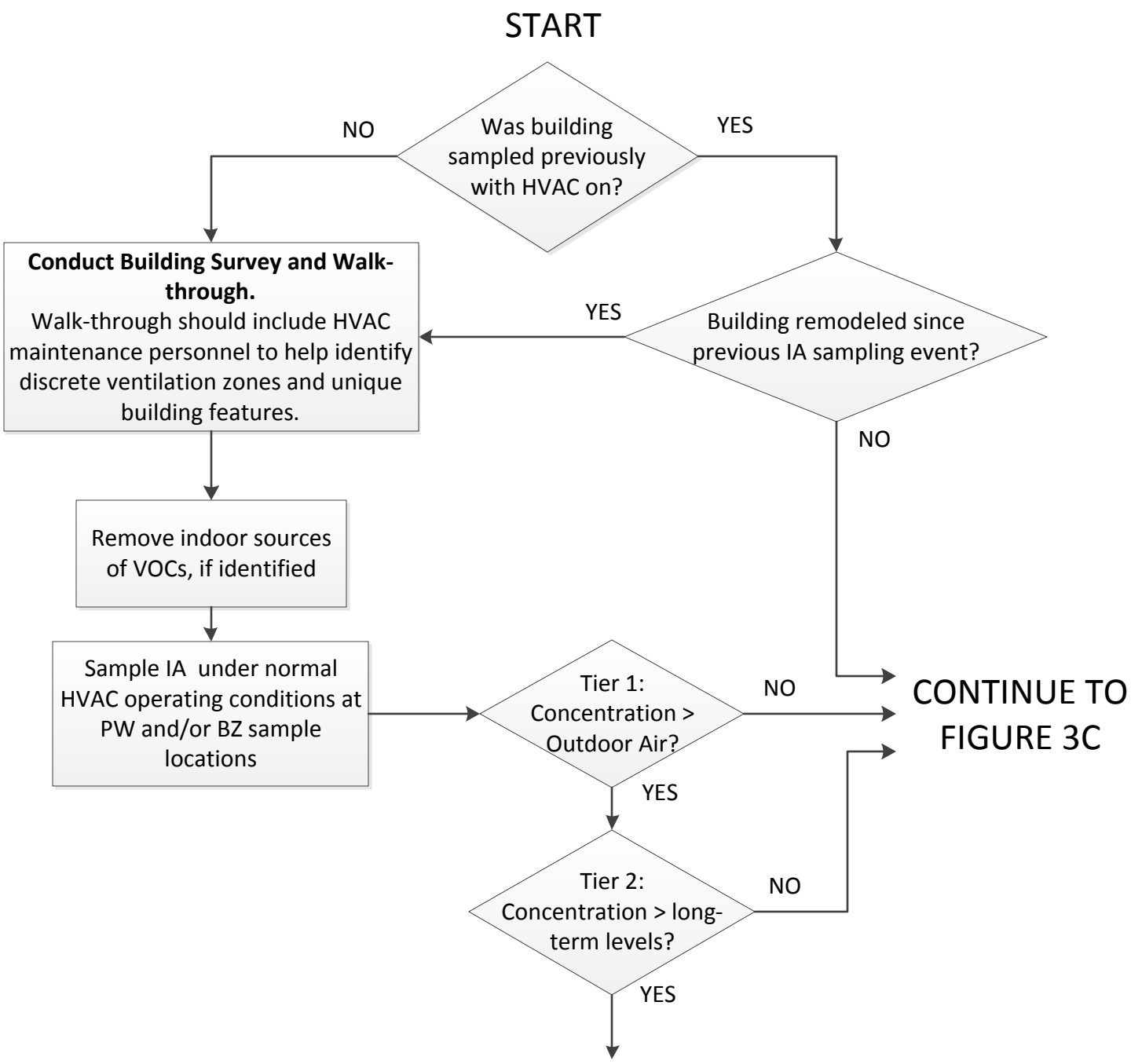
FIGURE

**2**




NOTES:
> = GREATER THAN
BZ = BREATHING ZONE
HVAC = HEATING, VENTILATION, AND AIR CONDITIONING
IA = INDOOR AIR
PW = PATHWAY
VI = VAPOR INTRUSION
VOCs = VOLATILE ORGANIC COMPOUNDS

FORMER SPECTRA-PHYSICS LASERS, FORMER TELEDYNE SEMICONDUCTOR
**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF FOURTEEN PROPERTIES IN THE OFF-PROPERTY STUDY AREA**

**DECISION FLOW CHART - BUILDINGS THAT HAVE NOT BEEN SAMPLED WITH HVAC ON OR HAVE BEEN REMODELLED**

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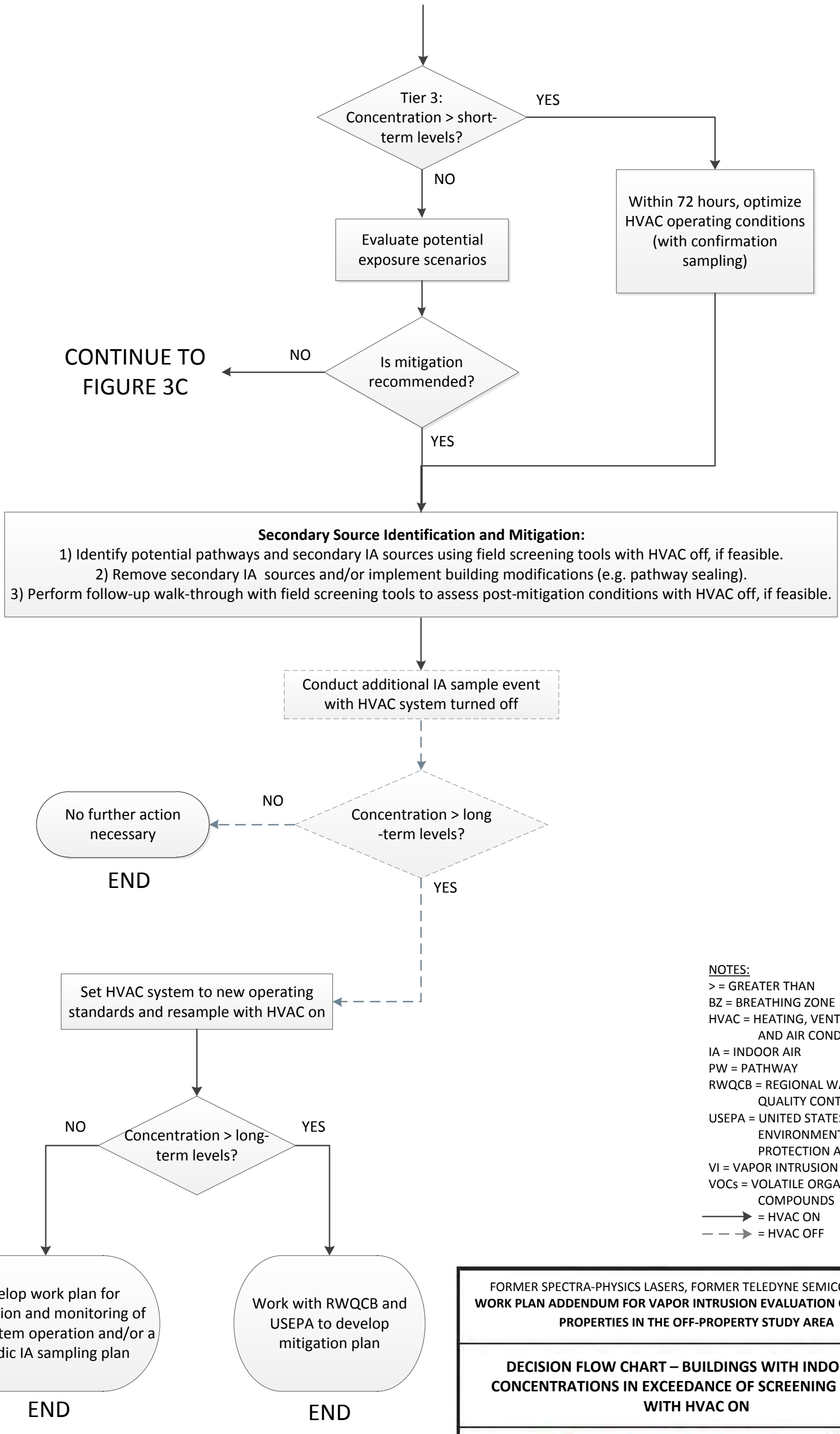
FIGURE
**3A**

CONTINUED FROM FIGURE 3A

(IA CONCENTRATIONS > TIER 2 CRITERIA WITH HVAC OPERATIONAL)




NOTES:
> = GREATER THAN
BZ = BREATHING ZONE
HVAC = HEATING, VENTILATION, AND AIR CONDITIONING
IA = INDOOR AIR
PW = PATHWAY
RWQCB = REGIONAL WATER QUALITY CONTROL BOARD
USEPA = UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
VI = VAPOR INTRUSION
VOCs = VOLATILE ORGANIC COMPOUNDS
→ = HVAC ON
- - → = HVAC OFF

FORMER SPECTRA-PHYSICS LASERS, FORMER TELEDYNE SEMICONDUCTOR
**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF FOURTEEN PROPERTIES IN THE OFF-PROPERTY STUDY AREA**

**DECISION FLOW CHART – BUILDINGS WITH INDOOR AIR CONCENTRATIONS IN EXCEEDANCE OF SCREENING CRITERIA WITH HVAC ON**

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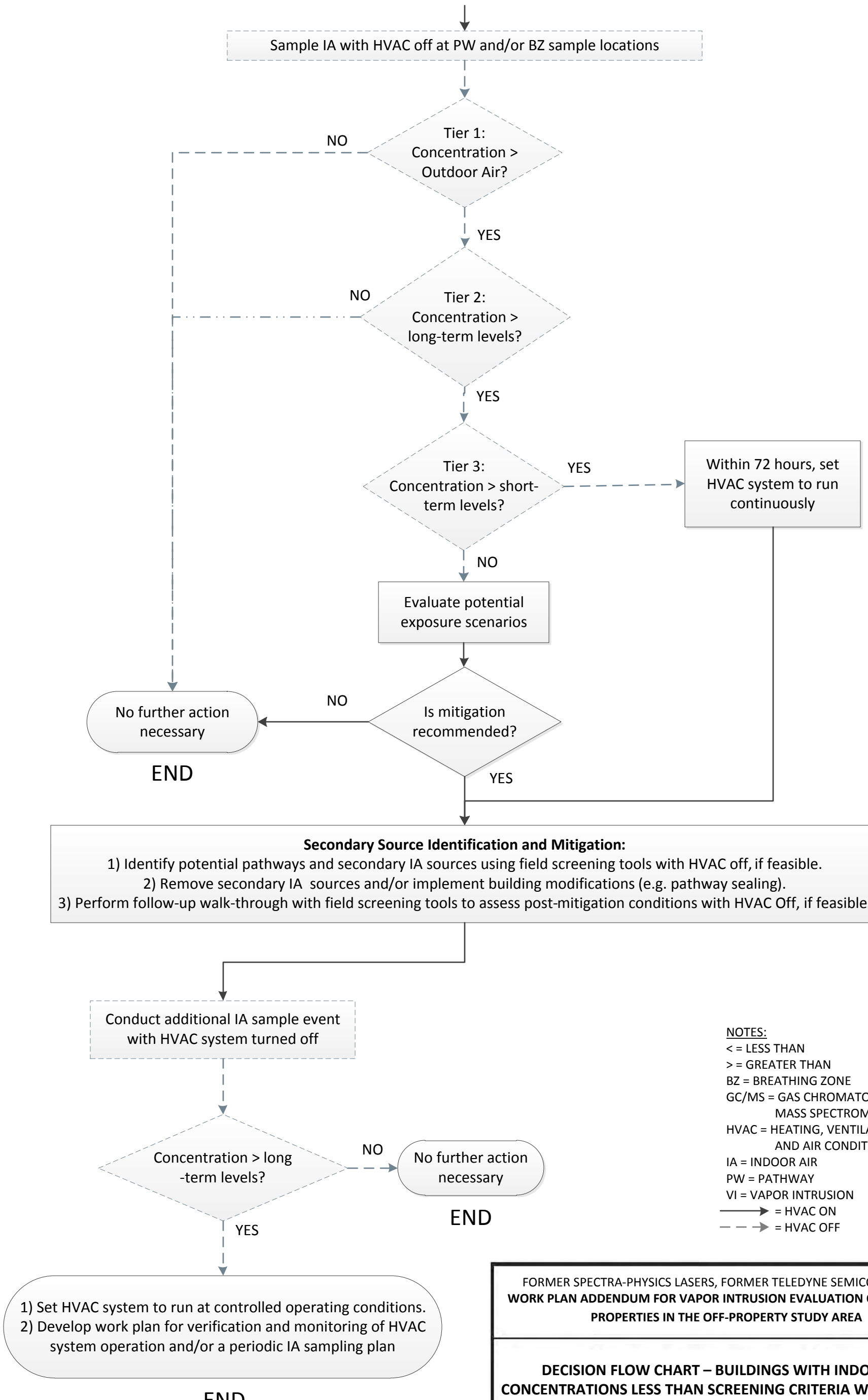
FIGURE
**3B**

# CONTINUED FROM FIGURES 3A AND 3B
## (IA CONCENTRATIONS < SCREENING CRITERIA WITH HVAC OPERATIONAL)




NOTES:
< = LESS THAN
> = GREATER THAN
BZ = BREATHING ZONE
GC/MS = GAS CHROMATOGRAPH/ MASS SPECTROMETER
HVAC = HEATING, VENTILATION, AND AIR CONDITIONING
IA = INDOOR AIR
PW = PATHWAY
VI = VAPOR INTRUSION
→ = HVAC ON
⇢ = HVAC OFF

FORMER SPECTRA-PHYSICS LASERS, FORMER TELEDYNE SEMICONDUCTOR
**WORK PLAN ADDENDUM FOR VAPOR INTRUSION EVALUATION OF FOURTEEN PROPERTIES IN THE OFF-PROPERTY STUDY AREA**

**DECISION FLOW CHART – BUILDINGS WITH INDOOR AIR CONCENTRATIONS LESS THAN SCREENING CRITERIA WITH HVAC ON**

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FIGURE
**3C**

**Attachment A**

Secondary Source Identification and Mitigation

**Attachment A: Secondary Source Identification and Mitigation**

Where additional evaluation and/or mitigation are deemed necessary based on the indoor air sampling plans described above, the following steps will be taken:

- Following confirmation of potential exposure scenarios, an additional detailed pathway and secondary source screening survey will be developed. A PID and/or a portable gas chromatograph/ mass spectrometer (GC/MS; "screening tools") will be used to help distinguish between potential alternative sources of COCs and pathways contributing to indoor air concentrations. These screening tools are intended to be used for instantaneous estimates (grab samples) of indoor air concentrations and information collected during the screening assessment should not be directly compared to exposure screening criteria.

- If identified, potential alternative sources of indoor air concentrations will be removed, if feasible. The potential pathways identified either in the initial building walkthrough or the detailed pathway survey will be mitigated following one of the following building modifications (additional measures may be proposed in the future).
  - Improving seals for plumbing, fire riser, telecommunication, electrical, and/or data conduits.
  - Installing vapor-tight covers on interior sumps, if applicable.
  - Evaluating drains to ensure p-traps are functioning properly.
  - Sealing the perimeter of drains to limit potential migration of vapors from surrounding soils.
  - Installing one-way flow drain trap seals in all drains
  - Sealing cracks visually identified in concrete floor slabs and walls, and at joints between walls and floor slabs, if feasible.
  - Improving air circulation and/or balancing pressure differentials in spaces through implementation of minor building modifications
  - Painting vapor seal paint on walls or other surfaces.

- Following completion of mitigation procedures, an additional walkthrough may be conducted using screening tools to assess the effectiveness of the building modifications and detect remaining VOC sources contributing to indoor air concentrations, if present. If screening tool results indicate additional mitigation measures are warranted, additional work may be performed.